ERRATA

SPECIFICATION No. 1,078,313

Page 1, Heading, Application made in Switzerland (first occurrence) *for* "Swttzerland" *read* "Switzerland"
Page 3, line 24, *after* "(2)]-" *insert* "2-"

THE PATENT OFFICE
12th February 1968

1,078,813

PATENTS ACT 1949

SPECIFICATION NO 1078813

The following amendments were allowed under Section 29 on 22 May 1978

Page 1, line 42, page 2, lines 99 and 100, *after* coating *insert* as a melt

Page 2, *delete* lines 5 to 15

Page 2, line 18, *delete* Poly-

Page 2, *delete* lines 19 to 41

Page 2, lines 43 and 44, *delete* either as a melt or as an aqueous dispersion *insert* as a melt

Page 2, lines 57 and 58, *delete* when a melt coating is applied

Page 2, *delete* lines 59 to 62, *insert* 0.0005 inch may be obtained. We find that the most

Page 3, *delete* lines 8 to 16

Page 3, *for* claims 13 and 14 *read* 10 and 11

Page 3, line 17, *delete* claim 10 *insert* any of the preceding claims,

Page 3, line 20, *delete* claim 10 *insert* any of claims 1 to 9,

Page 3, *delete* lines 23 to 33

Page 3, *for* claims 18 and 19 *read* 12 and 13

Page 3, lines 38 and 39, *delete* 10, 13 and 14 *insert* 1 to 11,

Page 3, *delete* lines 41 to 44

Page 3, *for* claims 21 and 22 *read* 14 and 15

Page 3, lines 45, 46 and 47, *delete* whenever made by a process according to any of claims 1 to 17 *insert* according to claim 13,

THE PATENT OFFICE
21 June 1978

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[*Price* · · · · · SLIP ATTACHED

PATENT SPECIFICATION

NO DRAWINGS

Inventor: DEREK GORDON HEDGE

1,078,813

1,078,813

Date of filing Complete Specification: March 1, 1966.

Application Date: March 11, 1965. No. 10379/65.

Complete Specification Published: Aug. 9, 1967.

Index at acceptance:—**B5** B23B; **B2** E(1D, 1H);

Int. Cl.:—**B 29 d**

COMPLETE SPECIFICATION

Heat Seal-Coated Polyester Films

We IMPERIAL CHEMICAL INDUSTRIES LIMITED, of Imperial Chemical House, Millbank, London, S.W.1., a British Company do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to heat seal coated films of synthetic linear polyesters, particularly of polyesters derived essentially from ethylene glycol and terephthalic acid.

Polyester films such as polyethylene terephthalate are very useful for wrapping, especially when oriented and heat set. Owing to their high melting point, however, packages made from such films cannot be easily sealed by conventional heat sealing machinery. Laminates of polyester film with, for example, polyethylene, are known, but these suffer from the disadvantage that they tend to delaminate and that a comparatively thick coating of heat sealable material is required.

The coating of polyester amorphous film and subsequent biaxial drawing of the coated film has been described in for example British Patent Specification 718422. This process involves at some stage drawing the films at an elevated temperature between two sets of tensioning rollers running at differential speeds and when such a process is applied to a coated film there is a tendency for the coating to stick to the drawing rolls. It is an object of the present invention to overcome this difficulty.

Accordingly we provide a process for the production of a heat seal coated, biaxially oriented synthetic linear polyester film comprising the steps of melt extruding a substantially amorphous polyester film, drawing the film in the longitudinal direction, thereafter applying a heat seal coating to one or both sides of said film and then drawing the coated film in the transverse direction.

By the term "drawing" we mean stretching the film at a temperature below its softening temperature but above its second order transition temperature to introduce molecular orientation into the film.

We prefer to use polyethylene terephthalate as the film material and in this case to draw the film in the longitudinal and transverse directions at a temperature between 78 and 125°C.

Various known types of apparatus which are designed to stretch continuous lengths of film in the machine and transverse directions are suitable for use in the drawing processes of this invention. For example, the film may conveniently be drawn in the machine direction by passing it between or around a pair or a series of slow rollers which may be heated to the desired temperature and then between or around a pair or a series of fast rollers. A useful alternative method of heating the film is by means of radiant heat, applied to a small length of film between the fast and slow rollers. The film may be drawn in the transverse direction in a stenter apparatus. For drawing in a stenter oven heating is preferred. We prefer to carry out the longitudinal drawing at a temperature between 78 and 100°C. and the transverse drawing at a temperature between 80 and 125°C., preferably between 100°C. and 125°C.

The biaxially oriented and coated film may conveniently be heat set at a temperature between 150 and 230°C.

By "a heat sealable coating polymer" we mean any polymer or copolymer which can be heat sealed by standard heat sealing equip-

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SPECIFICATION AMENDED - SEE ATTACHED SLIP

ment (see H. P. Zade, "Heat Sealing and High Frequency Welding of Plastics", Temple Press, London, 1959) on the film to which it is applied.

The heat seal coating may be applied as a melt, as a solution in an organic solvent or as an aqueous dispersion. In the latter two cases it is, of course, necessary to remove the organic solvent or the water in, for example, a drying oven and this may conveniently be combined with a pre-heating treatment of the film before transverse stretching. However, it is normally more convenient to apply the heat seal coating as a melt coat.

Polymers which may be conveniently applied to the film in the molten state include polyethylene and polypropylene. Polymeric coatings which may be applied in solution or as aqueous dispersions include vinylidene chloride polymer and copolymers of vinylidene chloride with one or more of acrylonitrile, itaconic acid or methacrylic acid, polyvinyl acetate, partially hydrolysed polyvinyl acetate, copolymers of vinyl chloride and vinyl acetate, butadiene/acrylonitrile copolymers, butadiene/styrene copolymers, butadiene/methyl methacrylate copolymers, butadiene/methyl methacrylate/styrene copolymers, methyl methacrylate/methacrylic acid copolymers, copolyesters of terephthalic acid and another dicarboxylic acid with a glycol, e.g. those containing not more than 4.0 molecular proportions of combined terephthalic acid to one molecular proportion of combined sebacic acid; copolymers of vinylidene chloride and vinyl chloride or alkyl acrylates, copolymers of vinyl acetate with vinyl chloride, copolymers of vinyl acetate with ethylene and copolymers of vinyl chloride with ethylene.

The coating compositions which are applied to the film either as a melt or as an aqueous dispersion may include in addition to the polymer forming the major constituent, antioxidants, dyes, pigments, lubricants, antiblocking agents, slip agents, i.e. comminuted solids which are insoluble in the heat sealable coating, e.g. starch, talc, zinc oxide, calcium carbonate, silica, titanium dioxide, triferric tetroxide, silicates, aluminates, alumino silicates.

The thickness of coated, biaxially drawn film which can be obtained using the process of our invention depends of course on the extent to which the film is drawn in the transverse direction, but when a melt coating is applied final thicknesses of from 0.00002 to 0.0005 inch may be obtained. In the case of coatings applied as aqueous dispersions final thicknesses of from 0.00002 to 0.00015 inch are obtainable. We find that the most useful coating thicknesses which can be easily produced and which give adequate heat seal strength are from 0.00008 to 0.00012 inch.

The coated films of the present invention may be used for packaging and for other applications in which a strong heat seal bond is required.

Our invention is illustrated but in no way limited by reference to the accompanying example.

EXAMPLE

A polyethylene terephthalate film was melt extruded and cast on to a rotating drum at about 80°C and then drawn in the machine direction with a draw ratio of about 3.5:1. It was then extrusion coated on one side with polyethylene. After coating the film was passed in to a stenter where it was drawn in the transverse direction at a temperature of 110°C with a draw ratio of about 3.5:1 and then heat set at 200°C. The thickness of coating on the finished film was 0.00015".

Samples of the film were sealed togther with their polyethylene coated surfaces in contact at a temperature at 130°C under a pressure of 10 p.s.i. for 2 seconds. The peel strength of the seals obtained was measured by determining the force required to pull the films apart. This was found to be in the range 100—120 gram/inch.

WHAT WE CLAIM IS:—

1. A process for the production of a heat seal coated biaxially oriented synthetic linear polyester film comprising the steps of melt extruding a substantially amorphous polyester film, drawing the film in the longitudinal direction, thereafter applying a heat seal coating to one or both sides of said film and then drawing the coated film in the transverse direction.

2. A process according to claim 1 in which the synthetic linear polyester is polyethylene terephthalate.

3. A process according to claim 2 in which the film is drawn in the longitudinal and transverse directions at a temperature between 78 and 125°C.

4. A process according to any of the preceding claims in which the film is drawn in the machine direction by passing it between or around a pair or a series of slow rollers which may be heated to the desired temperature and then between or around a pair or a series of fast rollers.

5. A process according to claim 4 in which the film is heated by means of radiant heat applied to a small length of film between the fast and slow rollers.

6. A process according to any of the preceding claims in which the film is drawn in the direction of extrusion at a temperature of between 78 and 100°C.

7. A process according to any of the preceding claims in which the film is drawn in the transverse direction at a temperature of between 80 and 125°C.

8. A process according to claim 7 in which the film is drawn in the transverse direction at a temperature of between 100 and 125°C.

9. A process according to any of the preceding claims in which the biaxially oriented coated film is subsequently heat set at a temperature of between 150 and 230°C.

10. A process according to any of the preceding claims in which the heat seal coating is applied as a melt.

11. A process according to any of claims 1 to 9 in which the heat-seal coating is applied as a solution in an organic solvent.

12. A process according to any of claims 1 to 9 in which the heat-seal coating is applied as an aqueous dispersion.

13. A process according to claim 10 in which the heat seal coating comprises polyethylene.

14. A process according to claim 10 in which the heat seal coating comprises polypropylene.

15. A process according to claim 11 or claim 12 in which the heat-seal coating comprises polyvinylidene chloride.

16. A process according to claim 11 or claim 12 in which the heat-seal coating comprises a copolymer of vinylidene chloride as hereinbefore described.

17. A process according to claim 16 in which the heat-seal coating comprises a copolymer of vinylidene chloride and acrylonitrile.

18. Linear Polyester film whenever made by a process according to any of the preceding claims.

19. Linear Polyester film whenever made by a process according to any of claims 10, 13 and 14 in which the thickness of the heat seal coat is from 0.00002 and 0.0005 inch.

20. Linear Polyester film whenever made by a process according to any of claims 11, 12 and 15 to 17 in which the thickness of the heat-seal coat is from 0.00002 to 0.00015 inch.

21. Linear Polyester film whenever made by a process according to any of claims 1 to 17 in which the thickness of the heat seal coat is from 0.00008 to 0.00012 inch.

22. Linear Polyester film substantially as hereinbefore described with particular reference to the accompanying example.

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Agent for the Applicants.

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